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New Data on Feeding Ecology of *Bubo bubo* and *Asio otus* (Aves: Strigidae) in Mongolia

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New data on feeding ecology of *Bubo bubo* and *Asio otus* (Aves: Strigidae) in Mongolia[1]

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Abstract

New materials of 10 Eagle owl *Bubo bubo* localities from Mongolia were analyzed. Feeding ecology of Long-eared owl *Asio otus* could be studied by investigation of pellets from 4 roosting or nesting places in S-Mongolia.

All together in the prey of *Bubo bubo* were analysed 1098 vertebrates (1017 mammals, 39 birds, 41 reptiles 1 fish), involved about 22 mammal species. In the pellets were dominant Lagomorpha with 23.3 % in SW-Mongolia, Dipodidae in W-, SW- and S-Mongolia (37.3 %, 23.4 %, 30.2 %), Cricetidae in SW- and S-Mongolia (13.6 %, 17.6 %), Gerbillidae in W- and S-Mongolia (19 %, 32. 1%) and Arvicolidae in W- and SW-Mongolia (23.8%, 23.8%). The percentage of birds was registered between 3.2 and 4.5 %. Rests of evertebrates (Arachnida, Solifugae, Scorpiones, Coleoptera, Orthoptera) were noticed in rare cases.

For *Asio otus* 747 vertebrates (726 mammals, 12 birds, 9 reptiles) as prey were determined. There were analysed about 13 mammal species. In the prey of the Longeard Owl are dominant the small Cricetidae species (*Cricetulus* and *Phodopus* with 50.5 %) as well as Gerbillidae (*Meriones* spec. 29 %) and the small Dipodidae (*Salpingotus* and *Cardiocranius*) with 12.3 %.

Key words: *Bubo bubo, Asio otus*, Mongolia, feeding ecology

Introduction

First results on feeding ecology of *Bubo bubo* were published by STUBBE & CHOTOLCHU (1968), PIECHOCKI et al. (1977), STUBBE et al. (1989) and HOFMANN et al. (2005). The new pellets were collected from 10 localities, especially in W-Mongolia. In 2007 JAVKHLANTSETSEG et al. published results on nest site and food composition of the Eagle Owl in Central and Northern Mongolia. They identified 276 prey from pellets and remains from nests. 72.1 % were mammals, 26.1 % birds, 0.7 % amphibians, and 1.1 % beetles. *Bubo bubo* is nesting in rocky mountains, steppe hills with broken rocks, lake shores with cliffs and river banks, forested areas and river valleys in all natural zones and belts in the country (GOMBOBAATAR & MONKS 2011). All nesting places which we found were in rock crevices or small caves. TUMURBAT et al. (2009) found five nests in cliffs, three in rock columns, two in sandy precipices and one in a rock ledge.

Asio otus is nesting in tree holes, deserts nests of Carrion Crow, Black-billed Magpie and raptors in various types of forests including coniferous and mixed forests in mountain taiga forest, forest steppe, patchy woodland in the steppe and lake and river valleys (GOMBOBAATAR & MONKS 2011). The species is also breeding in the arid Gobi zone.

The feathers of the Eagle Owl and Long-eared Owl have a high value in traditional custom and use, especially by the Kazakh inhabitants in the most western Aimag Bajan-Ölgij (see also PIECHOCKI 1980). As mascot you can find the feathers nearly in every ger at predestined places, near altarpieces or above the baby cradle. In Bajan-Ölgij it's possible to buy the feathers on the market or in shops (fig. 1). It means also that we have a conflict between old traditional behaviour and modern nature conservation.

[1] Results of the Mongolian-German Biological Expeditions since 1962, No. 337.

Fig. 1: Feathers, claws and whole skin of Eagle owl (in Mongolian: Shar shuvuu) and Long-eard owl (in Mongolian: Sooton guivanga) on the market and in gers - talismans of the Kazakh people in West-Mongolia (photos: A. & M. STUBBE).

Material and results

New materials from 4 of our old and pellets from 5 new Eagle owl localities, especially from S-Mongolia, were analysed now. At first, all skull remains were selected and determined.

Feeding ecology of *Asio otus* could be studied by investigation of pellets from 4 roosting or nesting places in S-Mongolia. *Asio otus* is distributed and breeding there in all greater dry desert valleys (sajrs, fig. 3) and oasis, stocked with *Ulmus pumila* or *Populus diversifolia*, maybe also in saxaul woodlands (*Haloxylon ammodendron*) of the desert. In Mongolia, the Long-eared Owl is a breeding visitor and a partial migrant. Migration routes and wintering localities are not investigated. According to GOMBOBAATAR & MONKS (2011), most of the breeding individuals arrive in the breeding sites by late April/early May.

Fig. 2: Typical breeding and feeding habitats of *Bubo bubo* in western (above: formerly valley of Čonocharajchijn-gol 1975, nowadays a hydroelectric power station) and southwestern Mongolia (below: upper course of Bulgan-gol, 2004); photos: M. STUBBE.

Fig. 3: Sajr Šutegijn Bajan-gol (Sum Manlai, South-Mongolia) - breeding and feeding habitat of Eagle owl and Long-eared owl (photo: M. STUBBE).

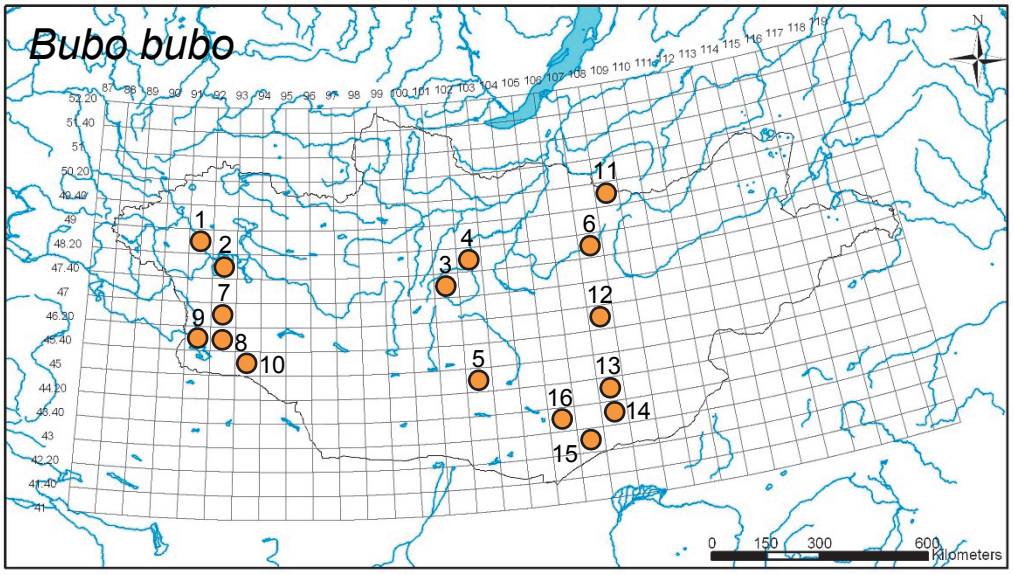


Fig. 4: Breeding localities of *Bubo bubo*: 1 - Ulaan-uul, 20 km W Chovd-chot, 2 - Čonocharajchijn-gol, 3 - Urd-Tamir-gol (Cencher Somon), 4 - Ugij-nuur, 5 - Arc-bogd (Gobi-Altai), 6 - Sajchany-Zaravč (50 km ENE Ulaanbaatar), 7 - Bodončijn-gol (upper course), Mongolian Altai; 8 - Bodončijn-gol (lower course), Dzungarian Gobi; 9 - Bulgan-gol (upper course), 10 - Guntamga, Dzungarian Gobi; 11 - Minž-gol, 12 - Ich Gazarijn Čuluu, 13 - Šutegijn Bajan-gol, 14 - 10 km SE Chanbogd, 15 - Undagijn-gol (Galbyn-gobi), 16 - Galbyn-gobi.

Table 1: Analyzed feeding composition of *Bubo bubo*

finding locations	2	8	9	10	11	12	12	12	13	13	13	14	15	16
year	2002	2002	2002	2002	2002	2004	2005	2010	2009	2010	2011	2005	2009	2004
MAMMALIA														
Insectivora														
Hemiechinus auritus	1	-	1	-	-	-	1	1	5	2	1	1	11	-
Sorex spec.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Lagomorpha														
Ochotona spec.	35	14	19	-	-	-	-	-	3	1	-	-	-	-
Lepus tolai	9	6	2	-	-	-	1	1	2	2	1	1	1	-
Chiroptera														
Myotis spec.	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Chiroptera indet.	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Rodentia														
DIPODIDAE														
Dipus/Allactaga spec.	143	5	30	2	-	-	4	5	52	25	22	8	9	-
Salpingotus/Cardiocranius	22	-	4	-	-	-	-	-	33	7	4	1	-	5
CRICETIDAE														
Cricetulus/Phodopus spec.	19	-	13	-	-	-	-	3	65	2	4	-	1	5
Allocricetulus spec.	4	-	11	-	-	-	-	-	-	3	-	-	-	-
GERBILLIDAE														
Rhombomys opimus	-	-	-	-	-	-	-	-	9	1	2	-	3	-
Meriones tamariscinus	-	-	9	-	-	-	-	-	-	-	-	-	-	-
Meriones spec.	84	-	5	-	-	12	-	17	73	16	2	8	2	14
ARVICOLIDAE														
Ondatra zibethicus	1	-	9	-	-	-	-	-	-	-	-	-	-	-
Ellobius tancrei	8	-	24	-	-	-	-	-	1	-	-	-	-	-
Eolagurus przewalskii	-	-	-	-	-	-	-	-	-	-	-	-	2	-
Microtus oeconomus	96	1	-	-	-	-	-	-	-	-	-	-	-	-
Microtus spec.	-	1	4	3	7	-	1	-	-	-	-	-	-	-
SCIURIDAE														
Marmota sibirica	-	1	-	-	-	-	-	1	-	-	-	-	-	-
Citellus spec.	-	3	-	-	1	-	-	-	-	-	-	-	-	-
AVES	14	5	3	-	1	-	-	1	6	7	-	2	-	-
REPTILIA														
LACERTIDAE	1	-	-	-	-	-	-	-	39	-	-	-	-	1
PISCES	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Arachnida	22	-	-	-	-	-	-	-	-	-	-	-	-	-
SOLIFUGAE	6	-	-	-	-	-	-	-	-	-	-	1	-	-
SCORPIONES	5	-	-	-	-	-	-	-	2 +	-	-	-	-	-
INSECTA	++	-	-	-	-	-	-	-	-	-	-	-	-	-

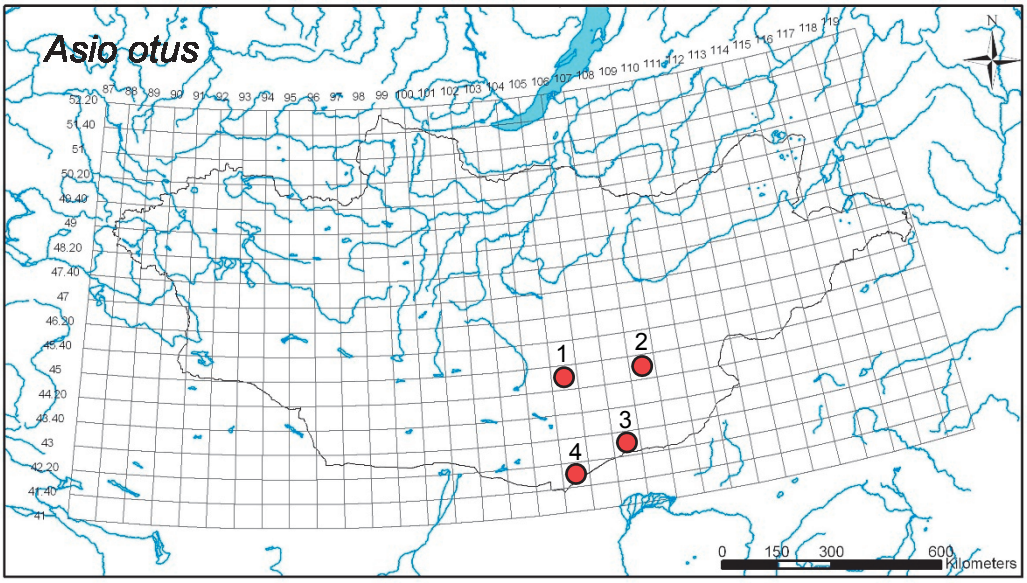
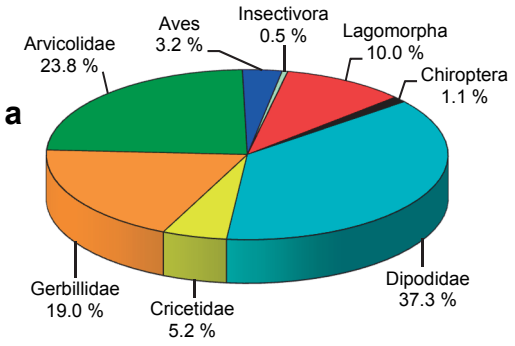


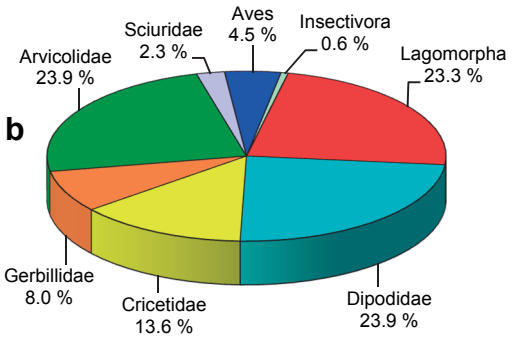
Fig. 5: 1 - Baruun chajlaastaj, ca. 20 km SE Cogt-Ovoo, 2 – Mandach Sum, 3 - Galbyn-gobi, 4 Bordzongijn-gobi, Ulaan Eregijn Sajr.

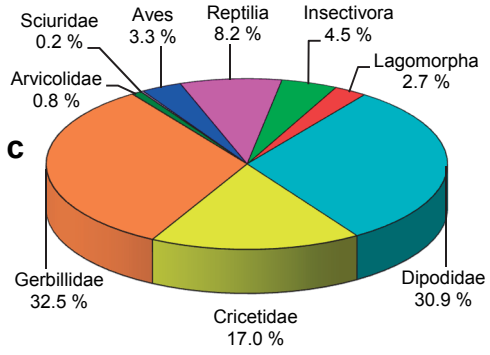
Table 2: *Asio otus* (finding locations 1-4)

MAMMALIA	n	%
Insectivora		
Hemiechinus auritus	1	0.1
Crocidura spec.	4	0.5
Lagomorpha		
Lepus tolai	1	0.1
Rodentia		
DIPODIDAE		
Dipus/Allactaga spec.	24	3.2
Salpingotus/Cardiocranius	92	12.2
CRICETIDAE		
Cricetulus/Phodopus spec.	373	49.3
Allocricetulus spec.	6	0.8
GERBILLIDAE		
Rhombomys opimus	13	1.7
Meriones spec.	217	28.7
ARVICOLIDAE		
Eolagurus przewalskii	4	0.5
AVES	12	1.6
REPTILIA	9	1.2
Vertebrata	756	
Insecta	23	

Fig. 6: Fledgling of *Asio otus* in the sajr Baruun chajlaastaj (photo: A. STUBBE).







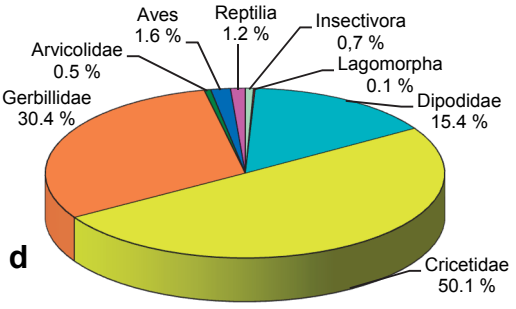


Fig. 7: Food composition of *Bubo bubo*: **a** - in West-Mongolia (locality 2), **b** - Southwest-Mongolia (localities 8 - 10) and **c** - South-Mongolia (localities 13 -16); **d** - *Asio otus* (1 - 4).

In total in pellets of *Bubu bubo* were analysed 1 098 vertebrates (1017 mammals, 39 birds, 41 reptiles, 1 fish), the mammals belonging to 22 species. In the pellets Lagomorpha (mainly *Ochotona pallasii*) were dominant with 23.3 % in SW-Mongolia, Dipodidae were dominating in W-, SW- and S-Mongolia (37.3 %, 23.4 %, 30.9 %), Cricetidae in SW- and S-Mongolia (13.6 %, 17.0 %) and Arvicolidae in W- and SW-Mongolia (23.8 %, 23.9 %. The percentage of birds was between 3.2 and 4.5 %. In N-Mongolia (Minž-gol) one fish was found as prey of *Bubo bubo.* Rests of evertebrates (Arachnida, Solifugae, Scorpiones, Coleoptera, Orthoptera) were noticed in rare cases.

In the pellets of *Asio otus* 756 vertebrates (735 mammals, 12 birds, 9 reptiles) were determined. The diet contained about 13 mammal species. Small Cricetidae (*Cricetulus* and *Phodopus*) were dominant with 50.5 %, followed by the families Gerbillidae (*Meriones* spec. - 29 %) and small Dipodiae (*Salpingotus* and *Cardiocranius*) with 12.3 %. In one nest - far from every human housing and activity - was found a recently caught *Mus musculus.*

Fig. 8: *Bubo bubo* fledgling ringed in the sajr Šutegijn Bajan-gol (photo: F.-U. MICHLER, 23.07.2011).

Discussion

Mammals are the main prey of *Bubo bubo*, but also many bird species could be found in the pellet analyses (PIECHOCKI et al. 1977, STUBBE et al. 1989). Micromammalia as Soricidae, the little jerboas *Cardiocranius* and *Salpingotus*, *Mus musculus* as well as small hamsters of the genus *Phodopus, Cricetulus* and *Allocricetulus* can be analyzed in various percentages in the prey. To the biggest prey belong hares (*Lepus tolai*) and *Ondatra zibethicus*.

Rare prey objects are carnivores and fishes. PIECHOCKI et al. (1977) and STUBBE et al. (1989) mention two juvenile Red foxes (Vulpes vulpes) and three Mustela erminea for the Čonocharajchijn-gol as prey of *Bubo bubo*.

Also in West-Mongolia, Čonocharajchijn-gol, we found two fishes (*Oreoleuciscus* spec.) and at the river Tuul-gol one *Brachymystax lenok* (localty 6) as prey of the Eagle owl (PIECHOCKI et al. 1977).

Remarkable are a lot of lower jaws of Lacertidae (s. table 1) in the pellets from Šutegijn Bajan-gol. There are living species of the genus *Phrynocephalus* and *Eremias*.

In table 3 and 4 we have summarized our results on feeding ecology of *Bubo bubo* in West- and Southwest-Mongolia between 1974 and 2002 in order to show also the dynamic in the biodiversity, differences from year to year as well as in the different ecosystems.

Table 3: Summarized data (vertebrates) of qualitative pellet analyses from feeding/breeding localities of *Bubo bubo* in West-Mongolia (localities 1 – 2), in brackets - year of collection

species/groups	PIECHOCKI et al. 1977 (1974/75)		STUBBE et al. 1989 (1982)		HOFMANN et al. 2005 (1984/85)		STUBBE et al. 2002 (2002)		**total**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
MAMMALIA										
Hemiechinus auritus	13	0.9	-	-	2	0.8	1	0.2	16	0.5
Soricidae	20	1.4	6	0.6	2	0.8	1	0.2	29	1.0
Chiroptera	1	-	2	0.2	-	-	5	1.1	8	0.3
Ochotona	85	6.2	256	27.6	15	6.1	35	7.9	391	13.0
Lepus tolai	35	2.5	11	1.2	11	4.4	9	2.0	66	2.2
Dipus/Allactaga	241	17.5	186	20.1	71	28.6	143	32.4	641	21.4
Cardiocranius/Salpingotus	50	3.6	72	7.8	33	13.3	22	5.0	177	5.9
Citellus	-	-	1	0.1	-	-	-	-	1	-
Phodopus/Cricetulus	146	10.6	88	9.5	7	2.8	19	4.3	260	8.7
Allocricetulus	4	0.3	3	0.3	19	7.7	4	0.9	30	1.0
Mus musculus	-	-	1	0.1	-	-	-	-	1	-
Meriones	54	3.9	72	7.8	11	4.4	84	19.0	221	7.4
Alticola	4	0.3	-	-	-	-	-	-	4	0.1
Eolagurus przewalskii	2	0.1	3	0.3	5	2.0	-	-	10	0.3
Ellobius tancrei	77	5.8	14	1.5	6	2.4	8	1.8	105	3.5
Microtus oeconomus	529	38.3	151	16.3	50	20.2	96	21.7	826	27.6
Ondatra zibethicus	-	-	5	0.5	-	-	1	0.2	6	0.2
Carnivora	3	0.2	2	0.2	-	-	-	-	5	0.2
Mammalia total	**1264**	**91.6**	**873**	**94.2**	**232**	**93.6**	**428**	**96.8**	**2797**	**93.3**
AVES	**114**	8.3	54	5.8	15	6.1	14	3.2	197	6.6
REPTILIA	**-**	-	-	-	1	0.4	-	-	1	-
PISCES	**2**	0.1	-	-	-	-	-	-	2	0.1
Vertebrates total	**1380**	**100**	**927**	**100**	**248**	**100**	**442**	**100**	**2997**	**100**

In the period from 1974 until 2002, we collected about 3.000 remains of vertebrates in the pellets of Eagle owls in West-Mongolia in the valleys of Čonocharajchijn- and Chovd-gol. The dominating mammals were species of the genus *Ochotona*, the great Dipodidae *Dipus sagitta* and *Allactaga sibirica* as well as especially *Microtus oeconomus* at the first place with 27.6% (16.3-38.3 %). Table 3 gives a reflection of dynamic processes in the mammalian community. *Ondatra zibethicus* was introduced in the Great Westmongolian Lakes (Char-us-nuur) in 1967 (DAWAA et al.1977) and was also observed at Čonocharajchijn-gol.

Table 4: Summarized data (vertebrates) of qualitative pellet analyses from feeding/breeding localities of *Bubo bubo* in Southwest-Mongolia; in brackets - year of collection

species/groups	STUBBE et al. 1989 (1980 & 1982)		HOFMANN et al. 2005 (1985 & 1988, 1991/92)		STUBBE et al. 2002 (2002)		**total**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
MAMMALIA								
Hemiechinus auritus	1	0.2	1	0.2	1	0.6	3	0.3
Soricidae	1	0.2	1	0.2	-	-	2	0.2
Ochotona	41	8.2	74	15.3	33	18.9	148	12.8
Lepus tolai	19	3.8	10	2.1	8	4.6	37	3.2
Marmota sibirica	-	-	-	-	1	0.6	1	0.1
Citellus undulatus	8	1.6	-	-	3	1.7	11	0.9
Dipus/Allactaga	57	11.4	44	9.1	37	21.1	138	11.9
Alactagulus/Scirtopoda	13	2.6	37	7.6	-	-	50	4.3
Cardiocranius/Salpingotus	12	2.4	5	1.0	4	2.3	21	1.8
Mus musculus	1	0.2	26	5.5	-	-	27	2.3
Dryomys nitedula	-	-	2	0.4	-	-	2	0.2
Phodopus/Cricetulus	88	17.7	117	24.1	24	13.7	229	19.8
Rhombomys opimus	-	-	1	0.2	-	-	1	0.1
Meriones	3	0.6	22	4.5	14	8.0	39	3.4
Eolagurus	3	0.6	55	11.3	-	-	58	5.0
Ellobius tancrei	115	23.1	50	10.3	24	13.7	189	16.3
Alticola	63	12.6	2	0.4	-	-	65	5.6
Microtus	33	6.6	10	2.1	9	5.1	52	4.4
Ondatra zibethicus	-	-	8	1.7	9	5.1	17	1.4
Carnivora	1	0.2	1	0.2	-	-	2	0.2
Mammalia total	**459**	**92.0**	**466**	**96.1**	**167**	**95.4**	**1092**	**94.2**
AVES	40	8.0	19	3.9	8	4.6	67	8.8
Vertebrates total	**499**	**100**	**485**	**100**	**175**	**100**	**1159**	**100**

In the period from 1980 until 2002 were 1.159 remains of vertebrates collected in the the pellets of *Bubo bubo* in Southwest-Mongolia. Dzungarian gobi and Mongolian Altai (locality 7 by STUBBE et al. 1989). At the upper course of Bodončijn-gol therefore we found more remains of *Alticola* and *Citellus*. In total *Ochotona*, the great jerboas *Dipus* and *Allactaga* as well as small hamsters (*Phodopus, Cricetulus, Allocricetulus*) and the subterrestrial living *Ellobius tancrei* were the main prey of the Eagle-owl.

Some peculiarities in the prey of Dzungarian region are *Dryomys nitedula* and under the gerbillids *Meriones tamariscinus. Ondatra zibethicus* was acclimatizised in the Bulgan-gol in 1971 (DAWAA et al. 1977) and is in the mentioned area now a welcome prey object too.

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